

REMARKS

By this amendment, claims 1-10, 12-22, 24-25, and 33-55 are pending in the application. Of these, claims 3, 5-6, 10, 12-21, and 24 are being amended. Claims 33-55 are being added. Reconsideration of the present case is respectfully requested.

Amendments to Specification

The specification has been amended to provide consistency between the terminology of the specification and the claims. It is believed that the amendments are supported by the specification, claims, and drawings as originally filed. Thus, no new matter is added, and entry of the amendments is respectfully requested.

In the paragraph starting on page 8, line 7, the addition of "is substantially non-vertical and" is supported by Figure 1 of the drawings, which shows an antenna coil that is substantially non-vertical.

In the same paragraph, the addition of "passing RF energy through the ceiling 106 and thereby" is supported by the language of the specification as originally filed, which in the same paragraph states that the dome "defines a surface 212 that supports an RF antenna," and that the "antenna 210 is coupled to a high power RF power source," and that "the dome 106 is permeable to the magnetic fields from the antenna 210 which control and enhance plasma characteristics." Thus, the RF power source, coupled to the antenna, generates RF energy which then passes from the antenna through the dome or ceiling and into the plasma. Also, Figure 2 of the drawings shows ceiling 106 with coil 210 above. From this we can see that RF energy is coupled through the ceiling. Similarly, the addition of "and RF energy" further on in the same paragraph provides clarification of the description without changing the meaning or content, and is supported as discussed above.

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Also, in that same paragraph, "As such, t" is deleted because it is a typographical error which is now being corrected.

In the paragraph starting on page 10, line 12, the addition of "partially dome-shaped" is supported by the language of the Specification as originally filed, for instance, on page 5, line 6, "a process chamber 100 is defined by sidewalls 102, a bottom 104 and a dome 106." Also, on page 8, line 7, "the dome 106 also defines a surface 212 that supports an RF antenna," and in Figure 3 of the Drawings, we see the section of dome 106 near window 123 to be flat, i.e. the ceiling is partially dome-shaped. Thus, the "partially dome-shaped" language is supported by the Specification and Drawings as originally filed, and does not add new matter.

Amendments to Claims

The claims are being amended to provide consistency between the terminology of the Specification and the claims. It is believed that the amendments are supported by the Specification, claims, and Drawings as originally filed. Thus, no new matter is added, and entry of the amendments is respectfully requested.

Claims 3 and 12 are being amended to remove the word "planar" and thus broaden the scope of the claim language.

Claims 5, 6, 14, 15, and 20 are being amended to change "optical energy" to "optical beam" to cosmetically improve the claim language. The terminology "optical beam" is supported in numerous places in the original Specification, including page 6, line 27; page 6, line 33; and page 9, line 32.

Claims 10, 13, 16, and 21 are being amended to change "ceiling of the process chamber" to "portion of the ceiling of the process chamber substantially facing the substrate" or a similar replacement. In the originally filed Specification, in the

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paragraph starting on page 8, line 7, we have a "dome 106 defines a surface ...that supports an RF antenna," and then further down, the "antenna coil covers approximately 2/3 of the support surface," and also the "antenna 210 is coupled to a high power RF power source," and further on, "the dome 106 is permeable to the magnetic fields from the antenna 210 which control and enhance plasma characteristics." Thus, the antenna covers a portion of the ceiling and couples RF energy from the RF power source through that portion of the ceiling to the gas inside the process chamber. Figure 1 of the drawings show that the portion of the ceiling supporting the antenna, and thus the portion through which RF energy is coupled, substantially faces the substrate, as recited in the amended claim.

Claims 17, 18, and 19 are being amended to further describe an "external surface" or more specifically they are being amended to recite a "wall" as comprising an "external surface". As show in Figures 1 of the drawings as originally filed, the chamber has a wall 106, and in Figure 2 we see more detail, i.e. the wall has a surface 212 that is external to the chamber. Thus, the chamber has "a wall, the wall comprising an external surface," as recited in the amended claim.

Claims 6 and 15 are being amended to replace "electromagnetic energy" with "X-rays." The fact that the window is permicable to X-rays is supported in the Specification as originally filed in several places, including on page 8, line 28, and on page 4, line 2.

Claim 24 is being amended to change its dependence from a cancelled claim to a currently pending claim.

Allowed and Objected to Claims

The examiner indicated allowance of claims 1-9. Claims 3, 5 and 6 are being amended to bring them closer to alignment with the Specification.

The Examiner also indicated that claims 12, 19 and 22 would be allowable if re-written in independent form and including all of the limitations of their base claims. Claim 12 is being re-written in independent form as claim 33, claim 19 is being re-written in independent form as claim 38 and thus these claims and the claims depending therefrom are believed to be allowable.

Rejection Under 35 U.S.C. 112, Second Paragraph, of Claims 24 and 25

The Examiner rejected claims 24 and 25 as being dependent on a canceled claim. Claim 25 depends from claim 24, and claim 24 is being amended to depend from pending claim 21. Thus the rejection of these claims is obviated.

Rejection Under 35 U.S.C 102(b) of Claims 10, 13-18 and 20

The Examiner rejected claims 10, 13-18 and 20 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,472,508 to Saxena. This rejection is traversed.

Claim 10 is not anticipated by Saxena because Saxena does not teach "inductively coupling RF energy through a portion of the ceiling of the process chamber substantially facing the substrate" and "detecting radiation from directly above the surface of the substrate after the radiation propagates through a window in the portion of the ceiling substantially facing the substrate" as recited in the claim.

Instead, Saxena teaches "a hollow housing 22 defines a process chamber 1" (column 3, lines 59-60) and "a coil 11 is wound around housing 22" (column 4, line 50) where "chamber 1 has viewing port 17 through which a detector or spectrophotometer can monitor the CVD process and can view the film surface of the substrate 4" (column 4, line 66 through column 5, line 1). Figure 1 of Saxena shows that the coil is adjacent to a side wall of an upper portion of the hollow housing and the viewing port is a top wall of the hollow housing. Thus, the apparatus of Saxena does not couple RF energy and detect radiation through the same portion of the ceiling, as recited in the claim, but instead couples RF energy through one portion of the ceiling that does not face the substrate, i.e. the side wall, and detects radiation through a substantially different portion of the ceiling that does face the substrate, i.e. the top wall. The coupling of RF energy and detection of radiation are through clearly distinct portions of the ceiling. The distinctness of these different portions of the ceiling in Saxena lies in the fact that one portion, the top wall, faces the substrate, and another portion, the sidewall, does not. Accordingly, claim 10 and the claims depending therefrom are not anticipated by Saxena.

Claim 17 is not anticipated by Saxena because Saxena does not teach "providing a chamber having a wall, the wall comprising an external surface that is at least partially dome shaped" and "inductively coupling RF energy at a power sufficient to pass the RF energy from above the at least partially domed external surface to the gas inside the chamber; and monitoring radiation from directly above a surface of the substrate that propagates through the at least partially domed external surface" as recited in the claim.

Instead, as discussed above, Saxena teaches "a hollow housing 22 defines a process chamber 1" (column 3, lines 59-60) and "a coil 11 is wound around housing 22" (column 4, line 50) and "chamber 1 has viewing port 17 through which a detector or spectrophotometer can monitor the CVD process and can view the film surface of the substrate 4" (column 4, line 66 through column 5, line 1). Figure 1 of Saxena shows that the coil is adjacent to a sidewall of an upper portion of the hollow

housing and the viewing port is a top wall of the hollow housing. Thus, the apparatus of Saxena does not couple RF energy and detect radiation through an external surface of the same wall, as recited in the claim, but instead couples RF energy through the sidewall, and detects radiation through a top wall, i.e. the coupling of RF energy and detection of radiation are through different walls. Accordingly, claim 17 and the claims depending therefrom are not anticipated by Saxena.

Rejection Under 35 U.S.C. 103(a) of Claims 21, 24 and 25

The Examiner rejected claim 21 under 35 U.S.C. 103(a) as being unpatentable over Saxena in view of U.S. Patent No. 4,953,982 to Ebbing et al. This rejection is traversed.

Claim 21 is patentable over Saxena in view of Ebbing et al. because neither Saxena nor Ebbing et al. teach "powering an antenna to inductively couple RF energy at a power sufficient to pass RF energy from outside an external surface of a portion of the ceiling of the first enclosure substantially facing the substrate to the process gas inside the first enclosure to energize the process gas; and monitoring a sufficient intensity of radiation from directly above the surface of the substrate from after the radiation has propagated through the portion of the ceiling and external surface of the first enclosure substantially facing the substrate and into a second enclosure disposed above the first enclosure to determine a process endpoint" as recited in the claim.

As discussed above, Saxena teaches a coil adjacent to a side wall of a hollow housing and a viewing port in a top wall. Thus, Saxena does not teach or suggest coupling RF energy and detecting radiation through the same portion of the ceiling, and instead teaches coupling RF energy through distinctly different portions of the ceiling. Furthermore, it would not be obvious to one of ordinary skill in the art based on Saxena to devise the claimed method because, as described in the specification, "the RF power may inductively couple into the neighboring monitoring equipment

thereby corrupting the monitoring signals" (page 2, lines 33-34.) Thus, on of ordinary skill in the art would expect that modifying the teachings of Saxena to couple RF energy through the top wall would interfere with the monitoring of radiation propagating through the same top wall. Accordingly, as the claimed method is not taught or suggested by Saxena, claim 21 and the claims depending therefrom are allowable over Saxena.

Ebbing et al. does not make up for the deficiencies of Saxena because Ebbing et al. also does not teach or suggest coupling RF energy through a portion of the ceiling substantially facing the substrate. Ebbing et al. teaches an endpoint detection system that is "enclosed within an enclosure 79 to protect the delicate optics and to minimize noise from such factors as air currents, etc" (column 9, lines 5-7). Ebbing et al. is silent with respect to the presence or location of a gas energizer capable of coupling RF energy, and thus does not teach or suggest coupling RF energy through a portion of the ceiling substantially facing the substrate. Accordingly, as both Saxena and Ebbing et al. fail to teach or suggest coupling RF energy and detecting radiation through the same portion of the ceiling, Claim 21 and the claims depending therefrom are patentable over these references.

The Examiner rejected claims 24 and 25 under 35 U.S.C 103(a) as being unpatentable over Saxena in view of Ebbing et al. and further in view of U.S. Patent No. 5,691,540 to Halle et al. This rejection is traversed.

Claim 21, from which claims 24 and 25 depend, is allowable over Saxena, Ebbing et al. and Halle et al because none of the references teach or suggest "powering an antenna to inductively couple RF energy at a power sufficient to pass RF energy from outside an external surface of a portion of the ceiling substantially facing the substrate of the first enclosure to the process gas inside the first enclosure to energize the process gas," as recited in the claim.

As discussed above, Saxena and Ebbing et al. do not teach or suggest coupling RF energy through a portion of the ceiling substantially facing the substrate.

Instead, Saxena teaches coupling RF energy through a side wall, i.e. a wall not facing the substrate, and Ebbing et al. does not teach or suggest coupling RF energy. Halle et al. does not make up for the deficiencies of Saxena and Ebbing et al. because Halle et al. also does not teach coupling RF energy through a portion of the ceiling substantially facing the substrate. Halle et al. teaches a radiation monitoring system that includes "a split UV fiber bundle" (column 2, line 59) and "a UV grade plano-convex lens and mount assembly" (column 2, line 67 through column 3, line 1). Halle et al. does not teach any type of plasma energizer and thus does not teach coupling RF energy through a portion of the ceiling. Thus, since Halle et al. does not teach or suggest coupling RF energy through a portion of the ceiling, and as discussed above, Saxena and Ebbing et al. do not teach or suggest coupling RF energy and detecting radiation through the same portion of the ceiling, Claim 21 and the claims depending therefrom, including Claims 24 and 25, are allowable over Saxena in view of Ebbing et al. and Halle et al.

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CONCLUSION

The above-discussed amendments are believed to place the present application in condition for allowance. Should the Examiner have any questions regarding the above remarks, the Examiner is requested to telephone Applicant's representative at the number listed below.

Respectfully submitted,

JANAH & ASSOCIATES
A PROFESSIONAL CORPORATION

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